

# MICRONEEDLE DEVICE FOR EXTRACTION AND SENSING OF BODILY FLUIDS

## Abstract of the Disclosure

Microneedle devices are provided for controlled sampling of biological fluids in a minimally-invasive, painless, and convenient manner. The microneedle devices permit *in vivo* sensing or withdrawal of biological fluids from the body, particularly from or through the skin or other tissue barriers, with minimal or no damage, pain, or irritation to the tissue. The microneedle device includes one or more microneedles, preferably in a three-dimensional array, a substrate to which the microneedles are connected, and at least one collection chamber and/or sensor in communication with the microneedles. Preferred embodiments further include a means for inducing biological fluid to be drawn through the microneedles and into the collection chamber for analysis. In a preferred embodiment, this induction is accomplished by use of a pressure gradient, which can be created for example by selectively increasing the interior volume of the collection chamber, which includes an elastic or movable portion engaged to a rigid base. Preferred biological fluids for withdrawal and/or sensing include blood, lymph, interstitial fluid, and intracellular fluid. Examples of analytes in the biological fluid to be measured include glucose, cholesterol, bilirubin, creatine, metabolic enzymes, hemoglobin, heparin, clotting factors, uric acid, carcinoembryonic antigen or other tumor antigens, reproductive hormones, oxygen, pH, alcohol, tobacco metabolites, and illegal drugs.